Research on the Coupling Coordination Pattern and Influencing Factors of Home-Community Elderly Care and Institutional Elderly Care in China Postprint

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Abstract

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Full Text

Coupling and Coordination Pattern and Influencing Factors of Home-Community Elderly Care and Institutional Elderly Care in China

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Abstract: Promoting the coupled and coordinated development of different elderly care models represents an effective pathway for optimizing the allocation of elderly care service resources in China. Based on panel data from 2018 to 2022, this study employs the coupling coordination degree model, geographic detector, and other methods to empirically analyze the spatiotemporal coupling coordination between home-community elderly care and institutional elderly care and its influencing factors. The results indicate that: (1) Both the coupling coordination degree and relative development degree between home-community elderly care and institutional elderly care exhibit an overall upward trend. The coupling coordination degree demonstrates a continuous positive trajectory over

time, while the relative development degree gradually clarifies into a pattern where synchronous development dominates, followed by lagging development of home-community care. (2) The number of provinces entering the coordination stage continues to expand, showing an evolutionary trend of gradual diffusion from central and eastern regions toward western and northeastern regions. The phenomenon of stage leaps in relative development degree is particularly significant, with the western region showing more leaping provinces than the central and eastern regions. (3) The coupling coordination degree displays positive spatial correlation with a fluctuating upward trajectory. The correlation intensity exhibits a spatial distribution pattern of western > eastern > central > northeastern regions, characterized primarily by high-high and low-low clustering types. (4) Organizational strength, elderly care demand, and technological level constitute the primary influencing factors. These findings provide theoretical foundations and decision-making references for resolving structural contradictions in elderly care service supply and innovating the development of elderly care policy systems.

Keywords: home-community elderly care; institutional elderly care; elderly care services; coupling coordination; influencing factors

1 Introduction

Home-community elderly care and institutional elderly care represent the two principal pillars of China' s elderly care service system. In recent years, both sectors have achieved considerable development amid increasing national attention to population aging. However, under the traditional segmented framework of "home-based, community-reliant, institution-supported," different care models have operated independently with minimal interaction, leading to inefficient resource utilization, fragmentation, waste, and uneven distribution that hinder the holistic and coordinated development of the elderly care service system. Consequently, the 14th Five-Year Plan established the new direction of "coordinated home-community-institution elderly care," while the *Opinions on Deepening the Reform and Development of Elderly Care Services* issued by the Central Committee of the Communist Party of China and the State Council further require "connecting and coordinating home-community-institution elderly care service forms." This raises critical questions: What are the interaction mechanisms between different elderly care models? What is the current level of coupled and coordinated development between home-community and institutional elderly care? And what are the key factors influencing this coordination? Addressing these questions is essential for resolving structural contradictions in elderly care service supply and implementing the national strategy of actively responding to population aging.

Existing research on the coupled and coordinated development of elderly care services has concentrated primarily on three aspects. First, regional coordinated elderly care serves as an important pathway for addressing regional elderly care challenges . Scholars have examined issues such as uneven spatial distribution

and scale structures [ ] , high administrative barriers [ ] , and missing coordination platforms [ ] , proposing strategies for coordinated elderly care in Beijing-Tianjin-Hebei, the Yangtze River Delta, and other regions from perspectives of institutional logic[ ], mechanism optimization[ ], factor guarantee[ ], and policy coordination[ ]. Second, research on the integration of medical and elderly care has analyzed policy effects and collaborative governance from perspectives of healthy aging[ ], governance innovation[ ], and service supply[ ]. Some scholars have also examined the coupling relationship between community health service centers and community elderly care institutions using coupling models [ ] . Third, regarding the coordinated development of home-community-institution care, some scholars emphasize linking these models through community-embedded elderly care services based on embeddedness theory [ ], while others explore how emerging technologies such as artificial intelligence and the Internet of Things can connect elderly care resources, services, and supervision to promote further development of home-community elderly care [ ] .

Despite these rich achievements, several gaps remain. First, research on regional coordinated elderly care focuses predominantly on cross-administrative cooperation within specific regions such as Beijing-Tianjin-Hebei and the Yangtze River Delta, with insufficient systematic discussion at the national scale. Second, specialized research on the coupling coordination between home-community and institutional elderly care concentrates mainly on institutional conceptualization or practical evaluation, with quantitative model applications limited to medical-nursing integration scenarios. Research quantitatively analyzing the spatiotemporal dimensions of coupling coordination between these two models remains particularly weak. Therefore, this study employs spatial autocorrelation analysis, coupling coordination degree models, and geographic detectors to empirically analyze the spatiotemporal coupling coordination and influencing factors of home-community and institutional elderly care in China, aiming to provide theoretical reference and decision-making basis for their synergistic and efficient development.

2 Theoretical Mechanism of Coupling Coordination between Home-Community and Institutional Elderly Care

Significant structural connections and coordination relationships exist between the home-community elderly care subsystem and the institutional elderly care subsystem. Through resource complementarity and service coordination, they constitute the core architecture of the elderly care service system, jointly satisfying the multi-level and differentiated needs of elderly individuals. The coupling and coordination process refers to the synergistic amplification effect generated through interactions between these systems, where the overall synergistic effect exceeds the sum of individual subsystem effects.

On one hand, institutional elderly care directly or indirectly supports and promotes home-community elderly care development. Relying on professional services, infrastructure, and policy support, institutions expand their operational

scale and scope to provide professional care services and skills training to nearby home-community units, effectively enhancing the supply capacity and precision of home-community services. This extension allows more elderly individuals to access high-quality, refined care services without leaving their homes. Simultaneously, institutional service outreach addresses the problems of high costs and fragmented resources caused by independent operation of community elderly care stations, reducing expenses through facility sharing and personnel scheduling while ensuring elderly individuals enjoy familial care, neighborhood warmth, and diverse social activities in familiar environments, thereby consolidating the foundational status of home-community elderly care.

On the other hand, home-community elderly care directly or indirectly drives institutional elderly care development. Using communities as bridges linking institutional and home-based care extends professional institutional services to home-community elderly, effectively transforming institutional management from single-project grid models to multi-project regional chain management models. This revitalizes idle elderly care resources, improves service supply efficiency, and promotes the large-scale development of institutional care. Moreover, elderly individuals receiving home-community services represent potential future demand for institutional services, creating a substantial consumer base that provides stable client sources for sustainable institutional development. Thus, the driving effects of home-community care on institutional care manifest primarily through consumption growth, market expansion, and efficiency improvement.

[Figure 1: see original paper]

3 Data and Methods

3.1 Indicators and Data Sources

This study examines 31 provincial administrative units in China (excluding Hong Kong, Macao, and Taiwan). Considering data availability, the research period spans 2018–2022. Data regarding elderly dependency ratios, per capita regional GDP, and broadband internet user proportions are sourced from the *China Statistical Yearbook*. Through keyword searches of "elderly care" or "elderly people" on provincial government portals, relevant functional department websites, and the Peking University Law Database, the count of eligible policy entries characterizes the number of elderly care policy documents. All remaining data are sourced from the *China Civil Affairs Statistical Yearbook*, with linear interpolation used to fill missing values for specific indicators.

3.2 Indicator System Construction

Based on the requirements for high-quality elderly care service development in the new era and following principles of availability, scientific validity, and completeness, this study references existing literature [] to construct an indi-

cator system for evaluating the coupled and coordinated development of home-community and institutional elderly care across three dimensions: personnel, hardware facilities, and service levels. Both the home-community elderly care subsystem and institutional elderly care subsystem contain three first-level indicators and corresponding second-level indicators (Table 1).

3.3 Research Methods

3.3.1 Entropy Weight Method This study employs the entropy weight method to calculate indicator weights for evaluating the coupled and coordinated development of home-community and institutional elderly care. Based on these weights and standardized indicator values, we measure the comprehensive evaluation values of both subsystems, effectively avoiding subjective influences in weight assignment. Specific calculation steps reference relevant literature [] .

3.3.2 Modified Coupling Coordination Degree Model Following the approach of Wang Shujia et al. [] , this study adopts a modified coupling coordination degree model to analyze the coordination level between home-community and institutional elderly care systems. The formulas are as follows:

$$T = \alpha U_1 + \beta U_2$$

$$C = 2\sqrt{U_1 U_2}/(U_1 + U_2)$$

$$D = \sqrt{C \cdot T}$$

where T represents the comprehensive coordination index between systems; U_1 and U_2 represent the comprehensive development level indices of home-community elderly care and institutional elderly care systems, respectively; α and β are undetermined coefficients. Given the equal importance of both elderly care models, the coefficients are set to 0.5; C represents the coupling degree; and D represents the coupling coordination degree.

Simultaneously, we employ a relative development model to reflect the relative development progress of the two systems:

$$E = U_1/U_2$$

where E represents the relative development degree, reflecting the relative development progress of the two systems.

Building upon relevant research [] , we carefully define the coupling coordination stages and relative development progress. For coupling coordination stages: when $D \in [0.0, 0.2]$, $[0.2, 0.4]$, $[0.4, 0.6]$, $[0.6, 0.8]$, and $[0.8, 1.0]$, these are

defined as severe imbalance, moderate imbalance, barely coordinated, moderately coordinated, and highly coordinated, respectively. In practice, when D approaches highly coordinated, efficient factor flow, high functional complementarity, and significant overall benefits characterize the relationship, manifested as deep embedding of institutional professional services into communities and precise community guidance of demand toward institutions. Conversely, when D approaches severe imbalance, weak connections, poor factor flow, and overlapping or misaligned functions result in institutional bed vacancies coexisting with community service shortages, resource waste, and low overall efficiency.

For relative development progress: when $E \in [0.0, 0.8]$, $[0.8, 1.2]$, and $[1.2, +\infty]$, these are defined as home-community elderly care lagging behind institutional care, synchronous development, and home-community elderly care advancing ahead of institutional care, respectively.

3.3.3 Spatial Autocorrelation Analysis This study first employs global spatial autocorrelation analysis to examine the spatial correlation and agglomeration degree of provincial coupling coordination degrees, further characterizing their spatial coupling development features. We then utilize local spatial autocorrelation analysis to examine the clustering characteristics of each spatial unit relative to adjacent units. Specific calculation steps reference relevant literature .

3.3.4 Geographic Detector This study utilizes the geographic detector to identify influencing factors and their interactive relationships affecting the coupling coordination between home-community and institutional elderly care. The formula is as follows:

$$q = 1 - \frac{1}{N\sigma^2} \sum_{h=1}^{L} N_h \sigma_h^2$$

where q ranges between $[0, 1]$, with higher values indicating greater explanatory power of the influencing factor; $h = 1, 2, \ldots, L$ represents the stratification (classification or zoning) of the coupling coordination level or influencing factors; N is the total number of study units; N_h is the number of units in layer h; σ^2 is the total variance of the study area; and σ_h^2 is the variance of layer h.

4 Results

4.1 Spatiotemporal Evolution of Coupling Coordination Relationships

4.1.1 Time-Series Evolution Characteristics [Figure 2: see original paper]

Figure 2 illustrates the evolution trends of coupling coordination degree and relative development degree between home-community and institutional elderly

care across provinces from 2018 to 2022. Regarding coupling coordination degree, the number of provinces in severe imbalance stages gradually decreased from 10 to 3, while all provinces reached at least moderate imbalance stages by 2020. By 2022, over 80% of provinces had advanced to barely coordinated stages, with fewer than 20% remaining in moderate imbalance, and 6 provinces reached moderately coordinated stages.

Regarding relative development degree, provinces where home-community care lagged showed an initial increase then decrease, rising from 14 to 18 between 2018–2019, then gradually declining to 10 by 2022. Provinces where home-community care advanced increased from 3 to 7. The number of provinces with synchronous development fluctuated but trended upward, reaching 14 by 2022. These patterns demonstrate that as development progressed from institution-led advancement to coordinated home-community-institution development, the relative development pattern gradually clarified toward synchronous development, though lagging development remained prevalent.

4.1.2 Regional Difference Characteristics [Figure 3: see original paper]

Using ArcGIS software, we mapped the spatial distributions of coupling coordination degree and relative development degree across Chinese provinces for 2018, 2020, and 2022 (Figures 4 and 5). Temporally, coupling coordination degrees across all regions showed similar patterns, maintaining steady upward trends except for temporary fluctuations in the northeastern region in 2019 and the western region in 2020. At the national level, the average coupling coordination degree evolved from severe imbalance to continuously optimizing barely coordinated status, though significant gaps remain before reaching high coordination.

Regarding relative development degrees, national trends showed yearly improvement. Home-community care transitioned from lagging behind institutions to relatively synchronous development. Notably, in 2018, northeastern home-community care remained relatively lagging while western home-community care advanced beyond institutions, suggesting both regions should emphasize systematic coordinated development between the two models.

In terms of coupling coordination, by 2018, only Hainan, Tibet, and Gansu remained in severe imbalance. By 2020, all provinces had escaped severe imbalance, with Tibet, Heilongjiang, and Inner Mongolia in moderate imbalance (western and northeastern regions) while others reached barely coordinated stages. By 2022, Tianjin, Shandong, and Hubei advanced to moderate coordination, with remaining provinces primarily in barely coordinated stages.

Regarding relative development, 2018 showed significant stage transitions nationally, particularly in the western region with more transitioning provinces than central or eastern regions. By 2020, Guangdong, Tianjin, Xinjiang, and Yunnan entered advanced development stages, though synchronous development provinces decreased slightly with most still lagging. By 2022, Shanxi and Anhui transitioned to synchronous development from lagging and advanced stages

respectively, while the overall spatial layout remained stable.

[Figure 4: see original paper]

4.2 Spatial Correlation Analysis of Coupling Coordination Relationships

Using ArcGIS 10.8, we conducted spatial autocorrelation tests on provincial-scale coupling coordination degrees for home-community and institutional elderly care, calculating Global Moran' s I and Local Moran' s I indices. Table 2 shows that Global Moran's I values ranged between 0.195–0.422 from 2018–2022, all greater than 0, with Z-values exceeding 1.96 in all years, passing significance tests at the 5% level. This indicates that the spatial distribution of coupling coordination degrees is not random but exhibits significant spatial clustering and influence from neighboring provinces. The fluctuating upward trend in Global Moran' s I suggests strengthening spatial correlation and agglomeration over time.

[Figure 5: see original paper]

Local spatial autocorrelation analysis reveals clustering types (Table 3). At least 8 provinces showed significant results in 9 out of 5 years examined, with most maintaining consistent clustering types over time, primarily high-high (H-H) and low-low (L-L) clusters. Shanghai demonstrated stable H-H clustering, indicating significant radiation effects promoting regional integration in the Yangtze River Delta. Inner Mongolia showed stable L-L clustering, where low coordination provinces typically lack medical, elderly care, and information technology infrastructure, with neighboring provinces facing similar difficulties that prevent synergistic pulling effects, creating development traps.

Regionally, the western region showed the strongest spatial correlation in 2022, with Inner Mongolia, Gansu, Guangxi, Guizhou, and Shaanxi (5 provinces) passing significance tests; the eastern region followed with Shanghai, Shandong, Hebei, and Jiangsu (4 provinces); the central region showed weaker correlation with Shanxi, Anhui, and Henan (3 provinces); while the northeastern region showed the weakest correlation, with only Jilin passing tests in certain years. Overall, spatial correlation strength follows a pattern of western > eastern > central > northeastern regions.

4.3 Analysis of Influencing Factors

Referencing previous literature and considering data availability, we selected six dimensions to explore influencing factors: elderly care demand (elderly dependency ratio), economic development (per capita GDP), talent team (elderly-related social work volunteers), organizational strength (number of social work institutions), policy support (number of elderly care policy documents), and technological level (broadband internet user proportion).

As shown in Table 4, all indicators except economic development passed significance tests ($P < 0.05$). Ranked by explanatory power (q-value), the factors are: organizational strength (0.360), elderly care demand (0.299), technological level (0.271), talent team (0.239), and policy support (0.145). Specifically, organizational strength reflects how social organizations and institutions integrate diverse resources, break boundaries between communities and institutions, and compensate for service supply shortages, deeply influencing coupled coordination. Elderly care demand indicates that regions with heavier elderly dependency burdens possess stronger motivation to improve resource allocation mechanisms while affecting neighboring regions' supply situations. Technological level is crucial for breaking physical spatial limitations between care models through information technology and smart products.

However, coupled coordination results from interactive effects among multiple factors. Two-factor interaction analysis (Table 5) reveals nonlinear enhancement and two-factor enhancement relationships among all factor pairs, with no weakening or independent relationships observed. Interactions concentrated above 0.5 involved combinations of social work institutions (organizational strength) and broadband internet penetration (technological level) with other factors. This suggests that physical institutions serve as carriers integrating medical and nursing services, while digital technologies overcome spatial-temporal constraints through internet platforms, bringing new opportunities for coordinated development.

5 Conclusions and Recommendations

5.1 Conclusions

(1) Temporally, both coupling coordination degree and relative development degree between home-community and institutional elderly care show growth trends. Most provinces have achieved barely coordinated status, though gaps remain before reaching high coordination. The relative development pattern has gradually clarified from institution-led advancement toward synchronous development.

(2) Spatially, the scale of provinces entering coordination stages continues expanding, diffusing from central-eastern regions toward western and northeastern regions. Stage leaps in relative development are significant, particularly in western regions.

(3) The coupling coordination degree demonstrates significant positive spatial correlation with fluctuating upward trends. Correlation intensity follows a "western > eastern > central > northeastern" spatial pattern, primarily characterized by high-high and low-low clustering.

(4) The coupling coordination degree is driven by multiple factors including elderly care demand, talent teams, organizational strength, policy support, and technological level, with organizational strength, demand, and

technology being primary drivers.

5.2 Recommendations

(1) Strengthen inter-regional cooperation by establishing coordination mechanisms between high-value clusters in central-eastern regions and low-value clusters in western and northeastern regions to promote cross-regional optimization of elderly care resources.

(2) Actively mobilize organizational strength by enhancing the status of social work institutions in the elderly care service system, fully leveraging their resource integration capabilities, and increasing service supply capacity. Adapt measures to local conditions based on regional elderly care demand differences: high dependency regions should focus on regulating supply-demand imbalances, while low dependency regions should prioritize infrastructure construction and explore regional characteristics.

(3) Prioritize smart elderly care infrastructure layout in western and northeastern regions where coordination levels remain low. Strengthen information platform construction to enable digital empowerment of coordinated elderly care service development, ensuring solid foundational capabilities in hardware facilities, data collection, and information processing while refining demand-linking and resource integration mechanisms.

(4) Strengthen volunteer talent team construction by stimulating enthusiasm for social elderly care services, improving professional capabilities and service levels, and guiding volunteers to play active roles in care services, elderly education, and legal aid. Increase reform efforts in service access, delivery, and evaluation while integrating policies to provide institutional guarantees for deep integration of home-community and institutional elderly care, ensuring government arrangements are fully implemented.

This study has limitations. First, calculations at the provincial scale cannot reflect micro-level conditions at municipal or county levels; future research should conduct more refined analyses. Second, limited by data availability, we examined only six factors, while cultural customs, capital investment, and medical levels may also warrant investigation.

References

[References list preserved as in original text]

Note: Figure translations are in progress. See original paper for figures.